# PHYS1001 for Term Fall 2025

Foundations of Physics I

We, the people of the Faculty of Science at Carleton University, acknowledge that our campus is located on the traditional, unceded territories of the Algonquin Anishinabeg people. Miigwetch for your hospitality and stewardship of this territory and the teachings that come from it. We are grateful for this land, the air that we breathe, and the water that sustains us all as well as for the animals, plants and other living beings: these enable us to research, teach, mentor, support, study, and learn. We recognize our responsibility to our natural environment and to reconciliation with Indigenous peoples.

---


**Course Instructor: Prof. Jesse Heilman**

**How to address me:** Professor Heilman

**Gender Pronouns:** (he/him/his)

**Email:** Jesse.Heilman@carleton.ca


Note: If you have or question or would like to talk with me, you can send an email, visit me during student hours (see below), or approach me after lecture.

**Best Ways to be in Touch:** in class, via email, or during student hours

**Student Hours: TBA, HP 3314**

**Office Location: Room 3314, Herzberg Laboratories**

**Class Location:** Please check Carleton Central for the room location.

**Class Times:** Tue/Thur, 10:05-11:25

**Preclusions: BIT 1002, BIT 1203, PHYS 1003, PHYS 1007**

**Department/Unit: Physics**

**Course TAs: TBD (will be announced on Brightspace)**

---

## Welcome to PHYS 1001!

**THIS COURSE FOCUSES ON TEACHING YOU THE BASICS UPON WHICH OTHER, MORE COMPLICATED PHYSICS IS BASED ON. WHILE LEARNING EQUATIONS AND HOW TO GET THE RIGHT ANSWERS FOR PROBLEMS IS IMPORTANT, THIS COURSE ALSO STRIVES TO BEGIN TO CHANGE HOW YOU THINK ABOUT THE WORLD AROUND YOU. THE REALITY OF HOW WORLD WORKS IS MYSTERIOUS AND BEAUTIFUL, AND IT IS NECESSARY TO THINK ABOUT IT CRITICALLY TO DEVELOP DEEP UNDERSTANDING. ASK QUESTIONS! CHALLENGE YOUR ASSUMPTIONS! ALWAYS REMEMBER: "WISDOM BEGINS WITH, 'I DO NOT KNOW.'"**

**Calendar entry:** This calculus-based course on classical mechanics covers kinematics, dynamics, gravitation, and oscillatory motion. This is a specialist course for students intending to take further courses in physics.

If you have not previously taken nor are currently enrolled in **MATH 1002, MATH 1004**, or **MATH 1052**, contact Professor Heilman immediately as they are necessary to be successful in this course.

**Course delivery:** The course will consist of a mix on synchronous and asynchronous activities. Scheduled class time will consist synchronous, in-person meetings where we will discuss the course material in a peer instruction style format. This interactive style of course delivery relies heavily on prior exposure of students to the fundamentals of the concepts under discussion. Thus, asynchronous reading assignments will be given in advance of each class. Students will come to class with a list of topics in which they feel less confident, and these will be used to guide classroom discussion. Students will then work in groups to analyze challenges presented by Professor Heilman and present their work to the class. Students will then have a

weekly set of problems to complete outside of class time which they will turn in for assessment. The in-person sessions are intended to synthesize the material covered, apply concepts, and develop collaboration with peers. It is highly recommended that you attend these sessions except in the case of an emergency.

**Lecture recording:** Given the nature of the class delivery, asynchronous recordings of the class periods are not a useful tool, and no recordings will be taken. I will disseminate the challenge problems covered in class via Brightspace.

# Topics Covered and Learning Outcomes

Science is for everyone. I am committed to fostering an environment for learning that is inclusive for everyone regardless of gender identity, gender expression, sex, sexual orientation, race, ethnicity, ability, age, class, etc. All students in the class, the instructor, and any guests should be treated with respect during all interactions. It is my hope that our class will support diversity of experience, thought, and perspective. I will continually strive to create inclusive learning environments and would therefore appreciate your support and feedback. I welcome emails or in-person communications to let me know your preferred name or pronoun. Please see the Faculty of Science Equity, Diversity, and Inclusion (EDI) statement: https://science.carleton.ca/about/edi/

## Topics by Week

| Week | Topic/Content | Readings/Prep for Class |
|---|---|---|
| **0** | This Course | Course Syllabus |
| **1** | Motion in 1D | H&R Ch 1: Measurement, H&R Ch2: Motion Along a Straight Line |
| **2** | Motion in 2D | H&R Ch 3.1-3.2: Vectors, H&R Ch4: Motion in 2D & 3D |
| **3** | Forces | H&R Ch 5: Force and Motion I, H&R Ch 6: Force and Motion II |
| **4** | Kinetic Energy | H&R Ch 7: Kinetic Energy and Work |
| **5** | Conservation of Energy | H&R Ch 8: Potential Energy and Conservation of Energy |
| **6** | Review/Midterm | |
| **7** | Momentum | H&R Ch 9: Centre of Mass and Linear Momentum |
| **8** | Rotations | H&R Ch 3.3: Vectors, H&R 10: Rotation |
| **9** | Angular Momentum | H&R Ch 11: Rolling, Torque, and Angular Momentum |
| **10** | Gravity | H&R Ch 13.1-13.4: Newton's Gravity |
| **11** | Gravity | H&R Ch 13.5-13.8: Orbits and Einstein |
| **12** | Oscillations | H&R Ch 15: Oscillations |

Important dates and deadlines can be found here: https://carleton.ca/registrar/registration/dates/academic-dates/, including class suspension for fall, winter breaks, and statutory holidays.

## Course level learning outcomes:

1. **Study** foundational concepts in classical dynamics.
2. **Apply** knowledge of physics concepts to analyze data, explain phenomena, and solve problems.
3. Learn to **draw conclusions** and **construct** scientific arguments based on evidence and reasoning.
4. **Appreciate** the beauty of the Universe.
5. **Collaborate** with your peers to improve understanding.

# Assessments

## Grade Breakdown

| COMPONENT | GRADE VALUE |
|---|---|
| **WEEKLY ASSIGNMENTS** | 30% |
| **LAB EXPERIMENTS** | 25% |
| **MIDTERM EXAM** | 10% |
| **FINAL EXAM** | 20% |
| **TUTORIALS** | 15% |

## Weekly Assignments

Weekly homework assignments will be distributed roughly each week throughout the term and will generally be due 1 week after distribution. They are designed to give you an opportunity to exercise technical and critical thinking skills in an asynchronous environment. Begin thinking about and working on your assignments as soon as you finish the pre-class reading.

Students are encouraged to discuss concepts and strategies related to solving the assignments; however, the work you turn in must be your own. The assignments are a critical part of the course and working through the problems yourself is essential to learn the material. Your homework solutions should be thorough, self-contained, and logical, with all steps explained.

Assignments will be posted on Brightspace. Solutions may be hand-written or type-set so long as they are easily understood and marked. Help us to give you marks by ensuring your work is legible and easy to follow. Sometimes this means rewriting your solutions once you complete the problem the first time so that your logic is easy to follow. Complete the assigned problems and submit a digital copy, as a single PDF file, of them on Brightspace before the due date. Ensure that your uploaded assignment is legible and your writing, if you hand wrote the solutions, is dark enough to easily read.

## Laboratories and Tutorials

There are six labs to be completed as shown on Brightspace (see your lab instructor for more details).

On five of the weeks where there is no lab to complete, the laboratory time will be given as tutorial sessions where students will complete problems with assistance of the lab staff and TAs. Ahead of these Tutorials, you must complete a reflection on your understanding of recent course material. These reflections are a part of the course mark and will help the TAs guide the topics that need focus during the Tutorials.

## Examinations

### Midterm

There will be a midterm examination scheduled during our regular class time during the last class before the break for the reading week: October 16th. This will be an in-person examination where you will answer the exam prompts in an exam notebook which will be provided to you on the day of the exam. We will discuss the examination in more detail during the term.

### Summative Final

There will be a summative final examination which will be scheduled centrally by the university during the fall examination period. This exam will follow the format of the Midterm but will be longer and cover all material that we will explore in the class.

### Progressive Formula Cards

Each week during the term, you will have the opportunity to synthesize what you believe to be the most important formulae or concepts that you would wish to use as a mental aide during exams in the form of a 3"x5" notecard. You can write on both sides of the card, but they must be handwritten. You will turn these into Professor Heilman during the Tuesday class period and they will be provided to you during both your midterm and final exams. It is a good idea to keep a copy for yourself as well so you can use them to guide your exam preparation.

## Late and Missed Work Policies

### Late Work

Without a specific accommodation granted by Professor Heilman, late work will not be accepted. Please contact Professor Heilman at least 24 hours prior to a due date if you would like to ask for an accommodation.

### Missed Work

Short-term ( 5 days or less): For extenuating circumstances beyond your control , you should fill out the academic considerations form and send it to Professor Heilman within 24 hours of the passing of a deadline. If you must consistently use this accommodation, then you must make an appointment with Professor Heilman to discuss your situation as below for Long-term accommodation.

Long-term (> 5 days): For longer term accommodations, fill out the longer-term accommodation form and schedule an appointment with Professor Heilman to discuss your situation .

---

# Learning Materials and Other Course Related Resources

| Learning Material | Options for Purchasing | Approximate Cost |
|---|---|---|
| Fundamentals of Physics, Halliday & Resnick | Campus Store, Used | $70 |
| Laboratory Notebook | Campus Store | $10.95+HST |
| 3'x5' Notecards | Campus Store, Office Supply Stores | $10 |

I will indicate reading assignments from the 12th edition of Halliday & Resnick. However, many textbooks present analogous material and so long as students read the chapters on the same material, any of those texts should be sufficient. For example, in previous years Physics for Scientists and Engineers by Serway and Jewett was used and there may be second hand copies available for the interested student. This same text will be recommended in PHYS1002.

# Academic Accommodations and Regulations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website (https://students.carleton.ca/course-outline/).

## Statement on Chat GPT/Generative AI usage

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

**AI use in this course:** Students may use AI tools for basic word processing and formatting functions, including:

- Grammar and spell checking (e.g., Grammarly, Microsoft Word Editor).
- Basic formatting and design suggestions (e.g., Microsoft Word's formatting tools, PowerPoint Design editor).

**Documenting AI use:** It is not necessary to document the use of AI for the permitted purposes listed above. If you have questions about a specific use of AI that isn't listed above, please consult Professor Heilman.

**Why have I adopted this policy?** This policy ensures that student voices and ideas are prioritized and authentically represented, maintaining the integrity of the work produced by students while allowing basic support to enhance clarity, correctness, layout, and flow of ideas. The goal of adopting a limited use of AI is to help students develop foundational skills in communication and critical thinking by practicing substantive content creation without relying on AI support.

**Limitations:** Students may not use AI for developing solutions to homework problems.

## Statement on Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools such as ChatGPT when your assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in Carleton University's Academic Integrity Policy. A list of standard sanctions in the Faculty of Science can be found here.

Additional details about this process can be found on the Faculty of Science Academic Integrity website.

Students are expected to familiarize themselves with and abide by Carleton University's Academic Integrity Policy.

## Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

## Student Concerns

If a concern arises regarding this course, **your first point of contact is me**: Email or drop in during student hours and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):

Note: You can also bring your concerns to Ombuds services.